

Analytical Measurement of Carbon and Nitrogen Cycles in Landfill Bioreactors

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ABSTRACT

Waste Management Inc. is implementing a bioreactor development program. Evaluating the relative merit of the different operating variants of bioreactor technology is one of the program's major initial objectives. Fifteen large-scale (>200,000 m³ each) demonstrations are planned to be underway at the company's landfills by the end of 2001 to accomplish this.

A focus of the sampling and analysis program for these demonstrations is to understand carbon and nitrogen cycling in solids, liquids, and gases of the landfill system. Accordingly, extensive sampling of waste, leachate, landfill gas, and surface emissions is being performed. Commercially available as well as research methods of sampling and analysis are being employed. Waste analyses include density, moisture, volatile solids, settlement, biochemical methane potential, cellulose, lignin, pH and inorganic nutrients. Leachate analyses include COD, forms of nitrogen, inorganic nutrients, pH, and phosphorus. Gas monitoring includes landfill gas and non-methane organics (NMOCs). Surface emissions testing and analyses include methane.

These are the methods, sampling tools and techniques have been selected to date. As the demonstrations progress and data are collected, the costs and benefits of each of these methods will become better understood and modified. Several unique techniques have been used to date. Bucket augering followed by obtaining weights of known volumes has been used for calculating the densities of waste mass. A global positioning system is being used to estimate waste mass density. Available nitrogen and phosphorus measurements in the waste are worth further collection and evaluation. Other areas under consideration for future study include identifying improved gas and emission sampling and analysis techniques, reducing the frequency of waste sampling, and refining the leachate parameters list.